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Approximately 80 Years in Approximately 120 Minutes

A talk by Lab Historian Alan Carr. The talk gives an overview of the history of the laboratory over the years. Eras covered include World War II, the Cold War, and the modern laboratory.

LOS ALAMOS
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NATIONAL SECURITY RESEARCH CENTER



Approximately 80 Years *In* Approximately 120 Minutes

Or: How Los Alamos Saved the World and Invented Tomorrow

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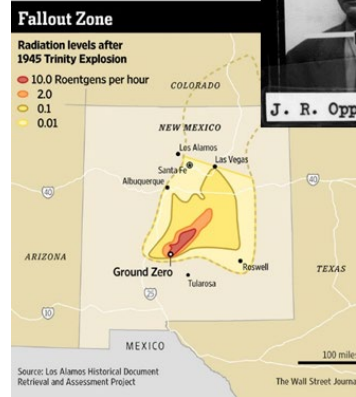
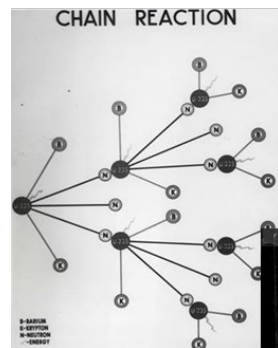
Alan B. Carr

NSRC Senior Historian
Program Manager

In the Beginning...



- Fission was first produced in Nazi Germany in late 1938
- Albert Einstein, at the urging of Leo Szilard, warned President Roosevelt in August 1939
- In September 1939 the Germans and the Soviets invaded Poland
- Japan attacked Pearl Harbor on December 7, 1941: “a date which will live in infamy”
- In April 1943, the first technical conference was held in Los Alamos
- Two entirely different types of nuclear bombs were completed in ~27 months
- The world’s first nuclear test was conducted on July 16, 1945
- Trinity produced a yield equivalent to 21,000 tons of TNT



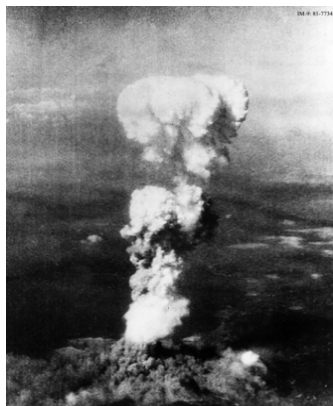
- “Some people claim to have wondered at the time about the future of mankind. I didn’t. We were at war and the damned thing worked.” – **Norris Bradbury**
- “Our first feeling was one of elation, then we realized we were tired, and then we were worried.” – **Victor Weisskopf**
- “The spectacle was tremendous, beautiful, magnificent, terrifying, exciting, humbling, scary.” – **Marge Bradner**
- “You could see it on their faces. I saw that something very grave and strong had happened to their whole outlook on the future.” – **Stan Ulam**



Helping End World War II



- On August 6, 1945 Hiroshima was bombed (Little Boy = 15 kt)
- 64,500 died by mid-November 1945
- On August 8 the Soviet Union declared war on Japan
- On August 9 Nagasaki was bombed (Fat Man = 21 kt)
- 39,214 died by mid-November 1945
- An armistice was declared on August 14
- Los Alamos received the Army-Navy “E” Award for excellence in wartime production on October 16





The Human Cost of a World War

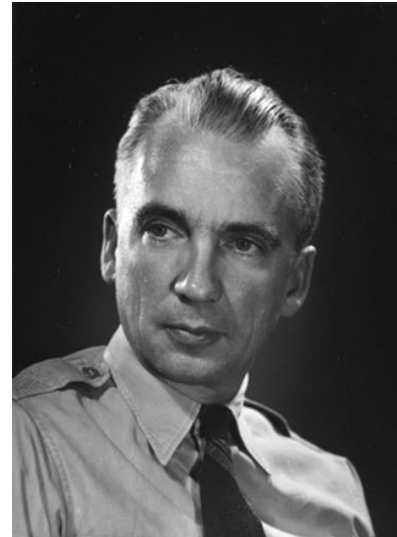
American Fatalities:	418,500 (~310/day)
Soviet Fatalities:	As many as 27,000,000 (~15K-20K/day)
American Pearl Harbor Fatalities:	2,402
Stalingrad <i>Casualties</i> :	~2,000,000
American D-Day Fatalities:	2,499
Operation Meetinghouse (Tokyo) Fatalities:	~100,000
Hiroshima Fatalities:	64,500 had died by mid-November 1945
Nagasaki Fatalities:	39,214 had died by mid-November 1945
Jewish Holocaust Fatalities:	~5,900,000
Chinese Fatalities:	As many as 20,000,000

"A single death is a tragedy, a million deaths is a statistic."

Joseph Stalin

WORLD WAR II CLAIMED BETWEEN 60 AND 80 MILLION LIVES

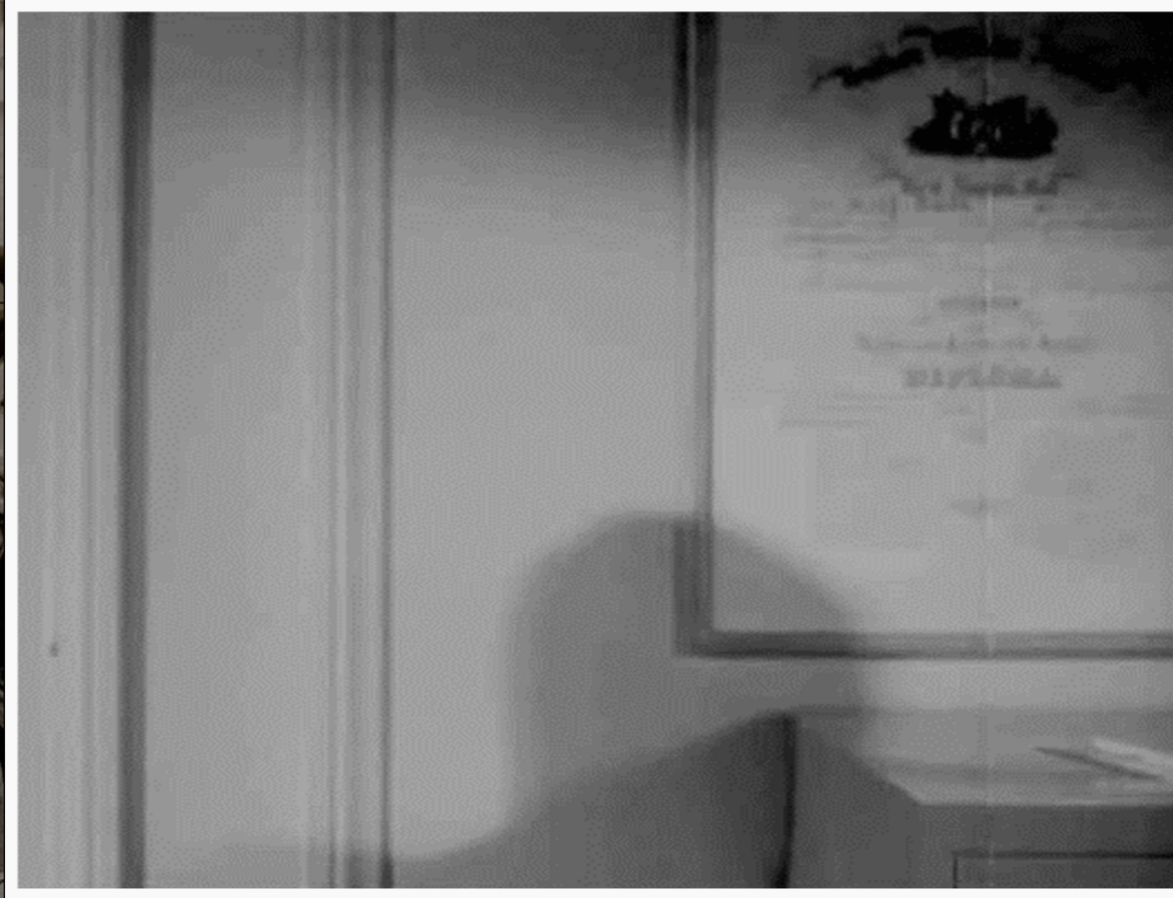
- Norris Bradbury was named Oppenheimer's successor
- His plan for the Lab:
 - 1.) *We will set up the most nearly ideal project we can*
 - 2.) *We will not discontinue weapon research until it is clearly indicated that this can be done*
 - 3.) *We will decrease the project in size so that it can be accommodated on the mesa on a civilian basis*
- Bradbury served as Director from 1945 to 1970
- He rebuilt the Laboratory physically and intellectually



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A-1



**"C" Is For
Communism**

The Cold War Escalates



- The U.S. did not diplomatically recognize the Soviet Union until 1933
- The Soviets had a pre-war history of aggression
- The Berlin Blockade: June 1948 to May 1949
- The first “Soviet” atomic bomb was tested in August 1949
- 1950 witnessed the formal end of the Chinese Civil War and the beginning of the Korean war
- A Soviet spy ring operating in the U.S. was exposed in 1950
- In the later 1950s, public fears were stoked by the Bomber Gap, the Missile Gap and Sputnik



THE EFFECT OF THE SOVIET POSSESSION OF ATOMIC BOMBS ON THE SECURITY OF THE UNITED STATES



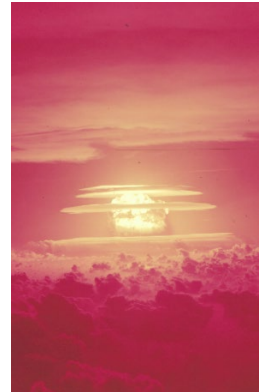
POSSIBILITY OF DIRECT SOVIET MILITARY ACTION DURING 1948



“The Strategic Value to the USSR of the Conquest of Western Europe and the Near East (to Cairo) prior to 1950.”



- The nation's stockpile grew from two to 31,255 weapons between 1945 and 1967
- During that same time, the United States conducted more than 500 nuclear tests
- The first full-scale thermonuclear test was conducted on October 31, 1952
- The first tactical nuclear weapon was tested in May 1953
- CASTLE-Bravo, the nation's largest test, achieved a yield equal to 15,000,000 tons of TNT (**1000x as powerful as LB!**)
- The U.S. and Soviet Union entered a testing moratorium in late 1958



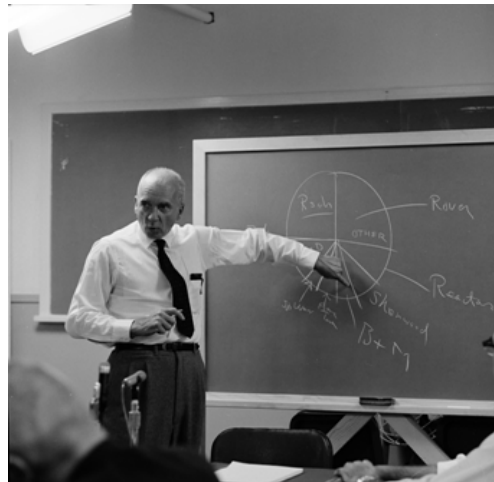
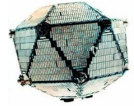
- May 1, 1960: A U.S. *spy weather reconnaissance plane* was shot down over the Soviet Union
- April 12, 1961: Yuri Gagarin became the first person to visit outer space
- Only five days later, the Bay of Pigs Invasion of Cuba unfolded ...*and promptly failed*
- France conducted a nuclear test April 25
- Construction on the Berlin Wall started in early August 1961
- The Soviets abrogated the testing moratorium on September 1, 1961 ...*what a surprise*
- September 15, 1961: The U.S. resumed testing
- The Tsar Bomba was tested October 30, 1961
- October 1962: The Cuban Missile Crisis





"Nothing Seems Impossible"

- In the late 1950s, the Laboratory began to diversify its mission
- Under Bradbury, Los Alamos became a nuclear science laboratory:
 - The development of nuclear powered rockets for space exploration (Project ROVER)
 - The development of nuclear verification technologies (Vela, CORRTEx etc.)
 - Controlled thermonuclear fusion research (Project SHERWOOD, SCYLLA)
 - Industrial applications for nuclear explosions (Operation PLOWSHARE)
 - Health Physics research
 - Subatomic exploration



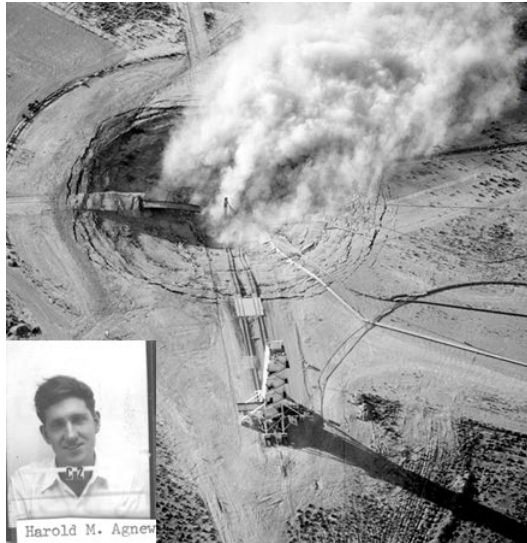


The End of Atmospheric Testing

- Between 1945 and 1992, the United States conducted well over a thousand nuclear tests
- 215 of those tests were conducted in the atmosphere, underwater or in space
- 106 tests (all atmospheric) were conducted in the Pacific
- 3 tests were conducted in New Mexico
- The last (true) atmospheric U.S. nuclear test was conducted November 4, 1962
- The Partial Test Ban Treaty entered into force October 10, 1963
- LASL-developed Vela satellites were launched October 17
- Norris Bradbury retired in 1970



A Time of Growth...



- The Laboratory doubled in size during the 1970s: 4000 to 8000 employees
- Under Harold Agnew, the multidisciplinary laboratory of today was born
- The Lab's portfolio grew to include fields of research wholly unrelated to nuclear weapons, such as the development of alternative energy sources
- Since the 1970s, thousands of IAEA inspectors have received training from Los Alamos

A Time of Change...



- The Laboratory was managed by the Atomic Energy Commission (AEC) from 1947 to 1974
- In the early '70s, the AEC was heavily criticized for failing to develop adequate environmental protection and safety standards
- Late in 1974, the AEC was dissolved: it had not changed with national priorities
- The AEC's functions were divided between the Nuclear Regulatory Commission and the Energy Research and Development Administration (ERDA)



THE EVER INCREASING BUREAUCRACY, COMPOSED OF MANAGERS WHO REQUIRE MORE AND MORE DETAIL, JUSTIFICATION, AND GUARANTEED SCHEDULES WILL, IN THE NOT TOO DISTANT FUTURE, COMPLETELY ERADICATE OUR NATION'S WORLD POSITION IN RESEARCH AND TECHNOLOGY.

BUREAUCRATIC REGULATIONS AND REQUIREMENTS FOR CONFORMITY WILL STIFLE BASIC RESEARCH. BUREAUCRACY WILL ERADICATE CREATIVE ENDEAVOR AND INNOVATION IN THE LONG RUN.

BUREAUCRACY EVENTUALLY LOSES SIGHT OF WHAT THE ORIGINAL OBJECTIVE WAS AND BECOMES ONLY CONCERNED IN ITS OWN MANAGEMENT AND CONTROL FUNCTION. UNLESS THIS TREND TOWARDS CENTRALIZATION IS SOMEHOW REVERSED I PREDICT THE U.S. WILL RAPIDLY LOSE ITS LEAD IN SCIENCE AND TECHNOLOGY.

Harold M. Agnew
2006

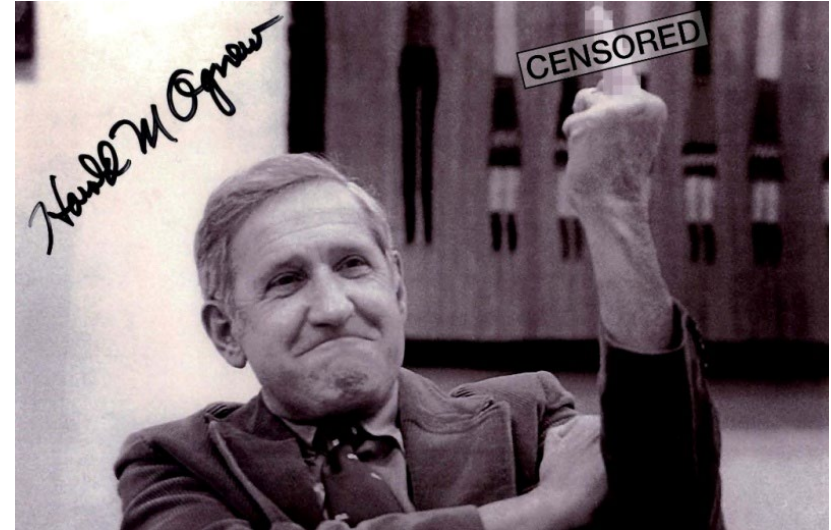
—Harold Agnew
Director, L.A.S.L.

Presented before the National Science Board, 1976

A Time of Challenges!



- The Laboratory was run by ERDA until 1977, when it was absorbed by the newly created Department of Energy (DOE)
- DOE was created to help ease dependence on foreign oil
- Between 1977 and 1985, imports dropped from 2.4 to 1.2 billion barrels a year
- The Joint Committee on Atomic Energy was disbanded in 1977
- The Lab was running out of friends!
- A growing number of University of California students objected to partnering with the labs in the '70s



“It used to be that the only people we had to deal with were the Joint Committee on Atomic Energy and the Atomic Energy Commission. Now, Harold has to answer to about a dozen Congressional committees. He just about has to chase all over to get anything done – just to talk to some bureaucrat.” – **Norris Bradbury**

Donald Kerr Becomes Director



- Bob Thorn, the Associate Director for Weapons, served as acting director from March to July 1979
- Donald Kerr became the Laboratory's fourth director on July 30
- Kerr, a Cornell-trained physicist, started at the Lab in 1966
- In the Field Testing Division (J), Kerr performed research pertaining to the physics of weapons effects
- The implementation of matrix management significantly changed the structure of the Lab

—News and Comment—

Los Alamos: The Winds of Mutiny

Does responsibility for bad morale at the birthplace of the bomb lie with the captain or the crew?





The Beginning of the Hecker Years

- After Kerr's departure in October 1985, Thorn once again served as acting director
- In January 1986, Sig Hecker became the Laboratory's fifth director
- Hecker was born in Poland during World War II – his family emigrated to the U.S. in the 1950s
- After receiving his Ph.D. from Case Western, Hecker came to the Lab as a postdoctoral fellow
- He joined the Lab as a staff member and later led MST Division
- Hecker's tenure started at a critical juncture in the Cold War

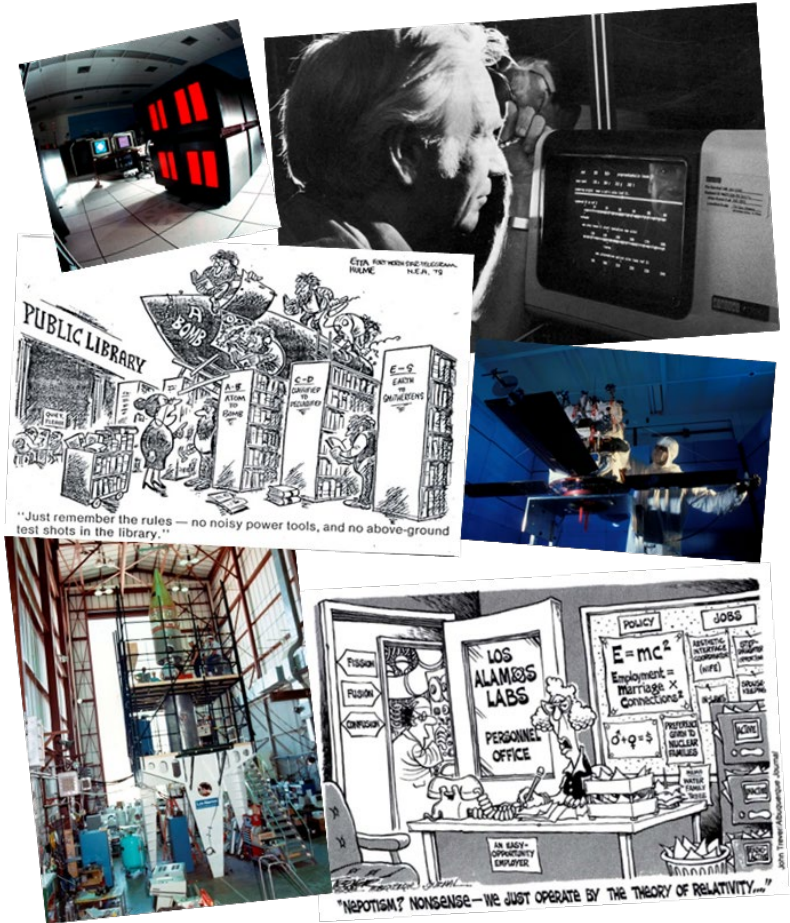




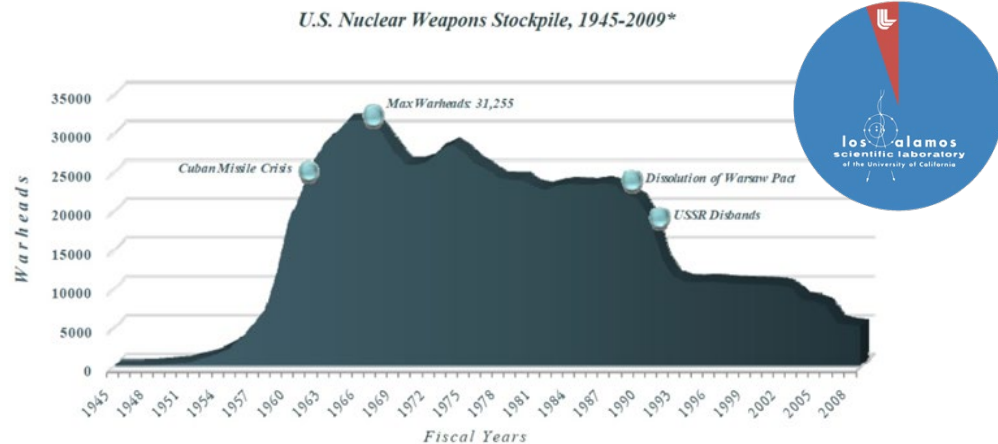
The Lab of the '80s and Early '90s

- The '80s was a decade of growing budgets and big, diverse projects at the Laboratory:
 - The Strategic Defense Initiative
 - The BEAR Project
 - The Antares laser
 - Laser isotope separation
 - Environmental restoration
 - Human genome studies
- President Reagan was seriously interested in the elimination of nuclear weapons
- It started to become clear testing would come to an end, but when?
- The Lab was involved in a series of public, high-profile mishaps during this time

Los Alamos
Los Alamos National Laboratory
Los Alamos, New Mexico 87545



Designing the Modern Stockpile

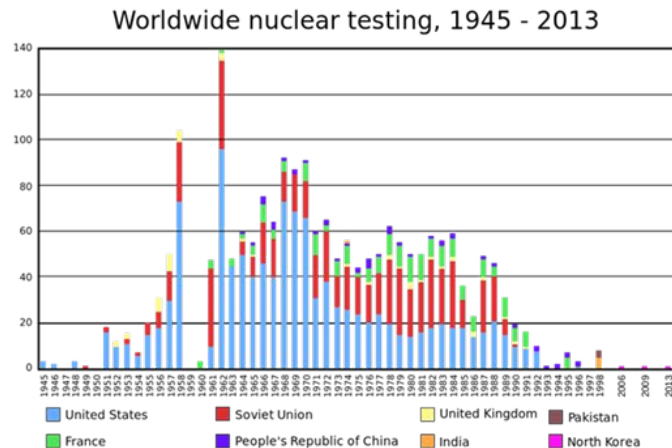


- Six of the seven nuclear weapons designs currently in the United States stockpile entered service between 1978 and 1988: W76, W78, W80, B83, W87 and W88
- Five of the seven nuclear weapons types currently in the stockpile were originally designed at Los Alamos: B61, W76, W80, W78, W88
- In January 2001, the W80 was transferred to Lawrence Livermore National Laboratory to “balance the workload” (AKA, *The No Lab Left Behind Program*)

- Starting in the mid-1980s, Soviet satellites nation's started demanding change
- The Revolutions of 1989 witnessed these countries gradually break-away from Moscow, one by one
- On December 26, 1991 the Soviet Union formally dissolved
- Why did the Soviet Union collapse?
- Was it the failure of the Soviet economic system to match western capitalism?
- Was it the failure of internal reforms, such as Perestroika and Glasnost, to maintain control?
- Perhaps the Soviet Union spent way too much on the military?
- Or maybe it was just David Hasselhoff?



The End of the Cold War ...and Full-Scale Testing



- The United States conducted its *most recent* nuclear test, *Julin-Divider*, on September 23, 1992
- On October 2, President Bush announced a moratorium on testing
- The Soviet arsenal had reemerged as a significant threat
...because it was not secure!

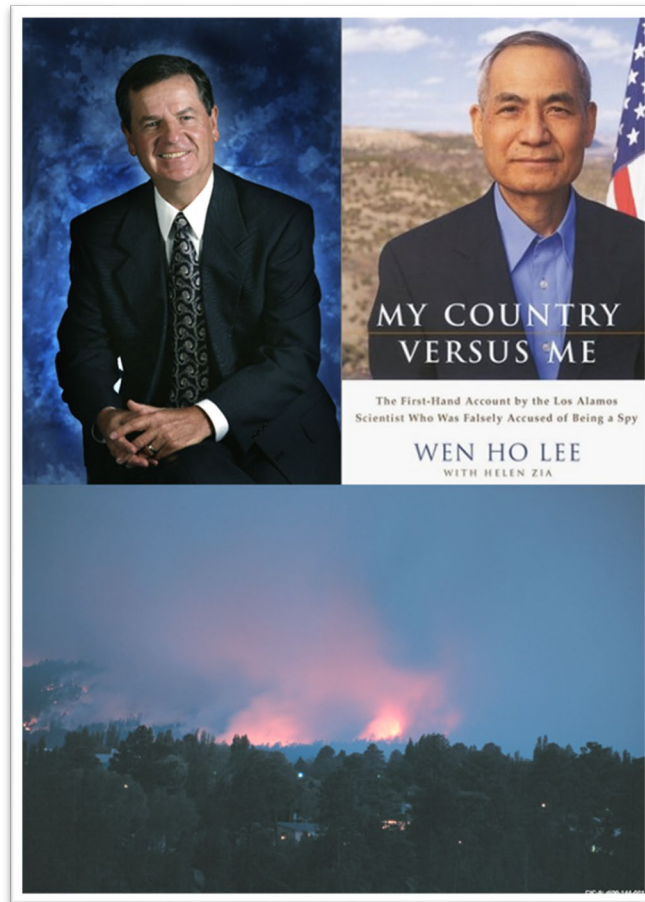
"We were indeed threatened at this time, 1992, more by Russia's weakness than by her strength."

Sig Hecker

A New Type of Manhattan Project



- John Browne became Director in 1997
- On December 10, 1999 LANL physicist Wen Ho Lee was arrested
- In May 2000, the Cerro Grande Fire destroyed hundreds of Los Alamos homes
- In June 2000, missing classified hard drives were recovered under “questionable circumstances”
- Lee ultimately pled guilty to one count of mishandling classified information and was released in September 2000
- At this point, many started calling for the termination of the UC contract
- **Nonetheless, the weapons laboratories invented Stockpile Stewardship during these difficult years**



A Time of Transition and Opportunity



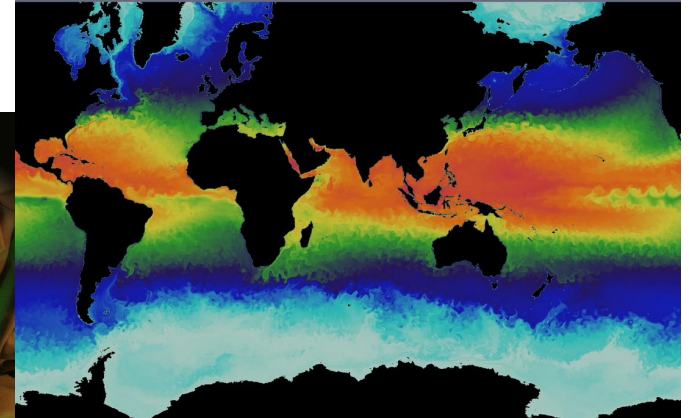
- Retired Vice Admiral Peter “Pete” Nanos became Director in 2003
- In the summer of 2004, two classified disks were reported missing
- During the investigation, work was halted across the Laboratory
- Ultimately, it was determined the disks never existed: these were arduous days
- In May 2006 Nanos left LANL and was replaced by Robert Kuckuck
- Kuckuck led the Laboratory during the last year of the UC contract
- Michael Anastasio became the first LANS director June 1, 2006
- Charlie McMillan and Terry Wallace also served as LANS Directors



Today's Laboratory



- For nearly 30 years, the Stockpile Stewardship Program has ensured the safety and reliability of U.S. nuclear weapons
- The Trinity supercomputer is ~40 times faster than the historic Roadrunner machine
- LANL scientists are exploring Mars while developing the next generation Curiosity Rover
- Our scientists are doing BIG things in nanotechnology at CINT!



Our Heritage of Innovation



1945: Los Alamos scientists conduct the world's first nuclear test

1945: Nuclear weapons developed at Los Alamos help end World War II

1946: The Monte Carlo method devised by LASL scientists

1946: LASL completes the world's first plutonium-fueled reactor

1951: First underground nuclear test conducted by LASL (according to DOE)

1951: LASL conducts the first nuclear test producing thermonuclear burn

1952: LASL conducts the first full-scale thermonuclear test

1953: LASL conducts the first tactical nuclear weapons test

1954: The largest United States nuclear test conducted by LASL

1956: The existence of the neutrino proven by LASL scientists (Nobel Prize)

1963: The heat pipe is invented by LASL scientists

1963: LASL-developed Vela satellites launched

1967: Gamma-ray bursts first detected by Vela satellites

1972: LAMPF produces an 800 MEV beam

1973: LASL's Nuclear Safeguards Program begins

1974: LAMPF ships its first medical radioisotopes

1979: IHE first used in a stockpiled nuclear weapon

1982: GenBANK established at LANL

1982: LANL's Cray X-MP named world's fastest computer

1984: LANL x-ray detectors used on GPS satellites

1988: Center for Genome Studies established at LANL

1988: LANL participates in Joint Verification Experiment

1990: National High Magnetic Field Laboratory established at LANL

1990: LANL begins participation in experiments that ultimately confirm neutrino mass

1992: LANL conducts the last U.S. nuclear weapons test

1995: Chromosome 16 is mapped at LANL

2002: The first 3D full-system weapons simulation is performed at LANL

2008: LANL's Roadrunner supercomputer breaks the petaflop barrier

2009: DARHT becomes the world's most powerful x-ray machine

2012: LANL scientists produce a 100T non-destructive magnetic field

2012: Curiosity Rover lands on Mars equipped with LANL instruments

2015: LANL scientists develop a breakthrough portable medical MRI device